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ABSTRACT

Three mentally retarded adult residents of a group home were trained to read survival words in four conditions (in the group home with one trainer; in the group home with two to three trainers; one trainer in the group home and the natural environment; and two to three trainers in the group home and the natural environment). Training was accomplished through the use of visual aids, instructions, modeling, feedback, and social reinforcement. In Condition 4, the most generalization to the natural environment occurred for two Ss, with less generalization occurring for all Ss in Condition 2. The least amount of generalization for two Ss occurred in Condition 1. Results tended to confirm the hypothesis that greater variation of stimulus conditions during the training of survival words will lead to greater generalization to novel situations in the natural environment. (CL)

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STIMULUS GENERALIZATION IN SURVIVAL WORDS TRAINING WITH MENTALLY RETARDED ADULTS[1]

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STIMULUS GENERALIZATION IN SURVIVAL WORDS TRAINING WITH MENTALLY RETARDED ADULTS

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To be effective, a therapeutic behavior change typically must occur over time, persons, and settings. The need to program generalization rather than expect it was recognized early by Baer, Wolf, & Risley (1968). However, at present there exists insufficient evidence with regard to the transfer of training effects to extra-therapy situations (Marholin, Siegel, & Phillips, 1976). After reviewing some 270 studies, Stokes & Baer (1977) concluded that the most frequent method of examining generalization in applied behavior analysis research could be labeled "train and hope". After a behavior change is brought about through manipulation of some response consequences, it is usually hoped that some generalization may occur, although it is not specifically programmed.

An example of the passive "train and hope" approach to generalization is provided by Gladstone & Spencer (1977), who had a model demonstrate a high level of response contingent praise in toothbrushing training sessions with retarded children. A pronounced and durable increase over baseline was observed in the level of contingent praise provided by mental retardation counselors not only in toothbrushing sessions, but also in "no treatment" hand and face washing sessions.

Although generalization has been reported when not specifically programmed, it often does not occur. For example, Redd & Birnbrauer (1969) showed that control over the cooperative play of retarded children did not generalize from an adult who dispensed contingent edible reinforcement to another adult who had not participated in training. It is likely that when reinforcement is delivered only in training conditions, stimulus control is developed. That is, the learner discriminates that the behavior being reinforced is reinforced under the training conditions and not reinforced elsewhere. Therefore s/he does not emit the behavior in other situations. Generalization will probably be limited to those situations which share stimuli similar to those in the training environment and will probably occur only as long as contingencies reinforce the behavior (Marholin, Siegel, & Phillips, 1976). Hence, several researchers (Griffiths & Craighead, 1972; Jackson & Wallace, 1974; Koegel & Rincover, 1974) have found that in order to achieve generalization of the effects of operant speech therapy with retarded and autistic subjects it was necessary to arrange contingencies in extratherapy settings so that appropriate speech was reinforced. Ayllon & Azrin (1968) deal with this problem by recommending that behavior analysts teach only behavior that will come under the control of natural reinforcers.

Transfer of training may be produced by programming specific discriminative stimuli during treatment that have a high probability of appearing in the post treatment environment (Marholin, Siegel, & Phillips, 1976). For instance, Page, Iwata, & Neef (1976) conducted pedestrian skills training with retardates on a model built

to simulate traffic conditions, and found that the acquired skills generalized to city traffic conditions.

Another way of producing generalization is to minimize discriminations. Kazdin (1975) suggested that varying the stimulus conditions of training will enhance transfer or training. This may be accomplished by using multiple exemplars and multiple settings in training. For example, when a conversational speech form taught to two retarded children by one experimenter did not generalize across experimenters, Garcia (1974) programmed generalization by having a second experimenter train the same responses. Similarly, Stokes, Baer, & Jackson (1974) did not find generalization of a greeting response in four retarded children to different experimenters when only one trainer was used. However, when a second experimenter trained and maintained the response in conjunction with the first experimenter, generalization of the greeting response occurred to over twenty members of the institutional staff.

Stokes & Baer (1977) note that little research has been reported in which programming generalization by training in a number of settings has been studied. The present study involved an investigation of the effects of training in a number of settings on generalization. It was predicted that the more stimulus conditions were varied during training, the more generalization to novel settings in the natural environment would occur. Retarded adults were trained to make appropriate responses to survival words

(e.g., fire, caution, restroom) in four conditions and then assessed for generalization to novel settings. The training conditions were (I) one trainer in one setting, (II) two to three trainers in one setting, (III) one trainer in several settings, and (IV) two to three trainers in several settings. It was predicted that condition IV would produce the most generalization and condition I would produce the least. Moderate degrees of generalization were predicted in conditions II and III, where the stimulus conditions were varied an intermediate amount.

METHOD

Subjects

Three mentally retarded adult residents of a group home participated in the experiment. Frances, a 27 year old female with an IQ of 43, was classified in the moderate range of retardation. Lore was a mildly retarded 27 year old female with an IQ of 57. Larry, a 33 year old male with an IQ of 36, was classified as moderately to severely retarded. The subjects were selected for the study on the basis of their reported inability to read survival words. While serving as subjects in this study, the residents were also involved in the continuing programs of the group home. However, none of these was concerned with survival words training.

Setting

Training in the group home took place in the living room, kitchen, hallway, or bedroom. The specific setting was selected so as to allow for the least possible interference from activities of other residents and staff. Also the training of some words required certain items to be present (e.g., two doors, a table).

Training in the natural environment took place in a variety of locations, such as grocery stores, industrial buildings, a movie theater, etc. Selection of the locations to be used for training was made on the basis of proximity to the group home and unfamiliarity to the subjects.

Design

A pool of 20 survival words was randomly assigned to 5 sets of 4 words each. Each subject was taken to places where these signs were displayed in the natural environment and asked to make the appropriate response. This was the pretest probe, which assessed which signs were already discriminative stimuli for appropriate behavior for each subject. The locations of signs, cues used, and criteria for correct performance, and results on the pretest probe are listed in Table 1. In order to avoid response sets (e.g., responding with a "yes" to all questions), distractor signs which called for responses different than those required by test words were also used shortly before responses to pretest words were required. With test words no verbal feedback was given to

the subjects, and a minimum of nonverbal feedback was given, so that minimal learning took place during the pretest probe. With distractor words, feedback with regard to the appropriateness of subjects' responses was given, in order to insure that subjects would respond differently to different words.

Since one subject demonstrated perfect performance on the pretest probe on one set of words, this set was discarded from the study. The remaining 4 sets of words were randomly assigned to the 4 experimental conditions for each subject. The order in which sets were trained was determined randomly for each subject.

One female and two female experimenters conducted training. Each experimenter spent an average of 534 minutes total time in training.

Training of appropriate responses to the survival words was accomplished with the use of visual aids, instructions, modeling, feedback with regard to the correctness of performance, and social reinforcement. Training in all experimental conditions proceeded as follows: First, the subject was shown a poster which depicted a survival word and a person either making the appropriate response or making the inappropriate response with a red X through the figure. The experimenter discussed what the word meant with the subject and had the subject repeat the word and what it meant. Then, the experimenter typically placed a sign on the wall or door and modeled the appropriate response. (For example, with the "rest-room" sign on the door, the experimenter said, "I go to the rest-room" as s/he pointed to the sign and walked through the door.) Next, the experimenter told the subject to make the appropriate

response in the presence of the survival word sign (e.g., "Go to the bathroom" in the presence of the restroom sign). Several different signs depicting the same word were used. Also, a distractor word sign was used in conjunction with the survival word sign (For example, "danger" was used as a distractor with "stop".) Immediately following the subject's response, s/he was given feedback about the correctness of his/her response and social reinforcement for correct responses. (For example, "That's good, you went in the men's bathroom." Or, "No, you can't go in when the sign says keep out.") Social reinforcement consisted of praise and physical contact.

A given word was trained to the same criterion performance level, regardless of the condition in which it was trained (typically 10 consecutive correct responses per word). However, in condition I, words were trained to criterion with the above procedures in the group home with only one trainer. In condition II, words were trained to criterion with the above procedures in the group home, but with two to three trainers. In condition III, words were trained with the above procedures by one trainer in the group home and in the natural environment; criterion performance was not reached until the subject was back in the group home. Words were trained the same in condition IV as in condition III, with the exception that two to three experimenters conducted training.

Written instructions for training were provided so that each

experimenter trained in approximately the same manner. An upper limit of 80 minutes training time was set for each word, after which training was discontinued for that word. Except for one subject on one word, all subjects reached criterion level performance on all words.

After a subject reached criterion performance on a word, s/he moved on to the next word in the set. After a word set was completed, training was discontinued for a minimum of two days, after which a posttest probe was conducted. The posttest probe was identical to the pretest probe. The subject typically began training on the next word set the day following the posttest probe.

Subjects were trained for approximately 8 weeks, usually 6 of 7 days per week. They were trained an average of 27 minutes per day per subject, with a maximum of 75 minutes training in one day.for one subject.

RESULTS

When the performance of all three subjects was viewed together, the highest performance (i.e., number of correct responses) at both pretest and posttest was found in words used in condition IV (See Figure I.). The most improvement (posttest minus pretest) was found in condition II. The same amount of improvement was found for condition I as condition IV, and no improvement was observed in condition III.

The above data are somewhat difficult to interpret in terms of the experimental hypothesis because subjects performed differently on the word sets for each condition on the pretest probe. Hence, in condition II, since only one correct response was made on the pretest probe, there was a possibility of making an improvement of 11. In condition III, since 8 correct responses were made on the pretest probe, there was a possibility of making an improvement of 4. In order to account for the different performance levels at pretest, the following formula was used: Percent of Possible Improvement Achieved = $\left(\frac{\text{Posttest Score} - \text{Pretest Score}}{\text{Total Possible} - \text{Pretest Score}}\right) \times 100$. Only positive numbers derived from this formula are meaningful (another formula would be needed to compute the percent of possible decrement that occurred). Thus, when the product of this equation was negative (indicating a decrease in performance between pretest and posttest), it was drawn on Figure 2 as zero, to indicate that none of the possible improvement was achieved. As Figure 2 indicates, with all subjects combined, the least percent of possible improvement was achieved in condition III, more in condition I, more in condition II, and most in condition IV.

When the combined performance of all three subjects was compared on sets of words independent of the condition in which they were trained, improvement was greatest on set C and least on set B (See Figure I.). Since word sets were randomly assigned to training conditions, it might be expected that a similar amount of improvement would occur for each word set. However, due to the small number of subjects used in this study, some subjects had

the same sets in the same conditions. For instance, two subjects were trained on set C in condition II. Since all subjects improved in condition II (even the subject who was trained on set B in this condition), it is likely that the conditions of training, rather than the sets of words used, were the main determinants of improvement. The same may be said of other word sets and training conditions. However, peculiarities of particular word sets may have exerted a relatively minor influence.

The mean training time for a subject per condition was 133.4 minutes (See Figure 3 for specific times.). On the average, the most time was spent training in condition IV, less in condition II, less in condition III, and least in condition I.

When the performance of individual subjects was considered, it was apparent that level of retardation waspositively correlated with length of training time: Larry, who was moderately to severely retarded, took the most training time; Frances, who was moderately retarded, took less training time; Lori, who was mildly retarded, took the least training time (See Figure 3.) An

examination of individual subjects showed that sometimes subjects got more words correct on the pretest probe than on the posttest probe (See Figure 2.). This indicates that subjects' response patterns on the pretest probe may not have always been a result of the discriminative function of the word stimuli. Figure 2 indicates that Lori's responding followed the predicted pattern of performance for each condition: highest percent of possible improvement was achieved in condition IV, less in conditions II and III, and lowest in condition I. Frances' results follow a similar pattern: highest percent of possible improvement was achieved in condition IV, less in condition II, and lowest in conditions III and I. Larry's responding was anomalous in that he achieved highest percent of possible improvement in condition I. However, the fact that Larry achieved a higher percent of possible improvement in condition IV than III was consistent with the experimental hypothesis, as was the fact that he achieved a moderate percent of possible improvement in condition II relative to the other conditions.

DISCUSSION

In general, the hypothesis that the more stimulus conditions are varied during training, the more generalization to the natural environment should occur was confirmed. Generalization was measured in terms of the achieved improvement in performance relative to possible improvement. In the situation where both settings and trainers were varied (condition IV), the most

generalization to a novel setting occurred in two of the three subjects. In the situation where the number of trainers was greater than one but training occurred in one setting (condition II), less generalization occurred in all subjects. In the situation where one experimenter conducted training in several settings (condition III), little generalization occurred in two of three subjects. The least amount of generalization was found in condition I (for two of three subjects), where one experimenter trained survival words in one setting. When stimulus conditions were varied the most, the greatest degree of generalization tended to occur. Intermediate varying of stimulus conditions resulted in moderate generalization. When stimulus conditions were varied the least, the least degree of generalization tended to occur. Since condition II resulted in a much larger achievement of possible improvement than condition III, it appears that training with multiple exemplars was more effective in producing generalization than training in multiple settings.

Presumably, the mechanism by which varying the stimulus conditions during training enhanced generalization was reduction of the discriminative function of stimuli in the training environment. However, in conditions III and IV, it may be that generalization was enhanced by a different process. Since part of training was conducted in the natural environment, most of the same discriminative stimuli functional in training were probably present in the posttest probe setting.

There are several factors which limit the above conclusions. For example, the small number of subjects limits the confidence with which the results of this study can be generalized to training with other retarded persons. Moreover, the small number of subjects precludes statistical analysis of the results. Without statistical analysis, it is difficult to assess whether significantly more time was spent training one set of words compared to another, whether subjects performed significantly better on one set of words compared to another, or whether subjects performed significantly better in one training condition than another. This information would be important in determining the functional equivalence of the word sets and the relative efficiency of the training conditions.

The fact that the most training time was spent in condition IV, where the most generalization was observed, might indicate that it was the amount of training, rather than the training condition that determined the degree of generalization. This is unlikely however, since condition II resulted in almost as much generalization as condition IV, yet took approximately the same amount of training time as conditions I and III.

Another problem with interpretation of the results lies in the nature of the pretest and posttest probes. It is possible that subjects' behavior was under the control of other environmental stimuli than the test words some of the time, such as fences, traffic, or possibly subtle nonverbal cues inadvertently emitted

by probers. This is supported by the finding that sometimes a subject would make the appropriate response to a survival word on the pretest probe, but make an inappropriate response to the same word on the posttest probe. Stokes, Baer, & Jackson (1974) have pointed out that when generalization is tested by only one prober, it is possible that the choice of the particular prober might well determine the conclusion drawn. There may be a large range of responses received by different probers. Since only one prober was used for any probe in this study, it is possible that uncontrolled individual differences in probers could have biased the results. Also, if a particular prober had trained a word set, he might function as an S^D for an appropriate response on posttest, whereas a prober who had not conducted training on that set might function as an S^{Δ}.

Perhaps one reason that generalization occurred with one subject (Larry) in condition I was that stimulus conditions were varied even when training was conducted with one experimenter in the group home. The fact that different rooms in the group home and different training stimuli were used probably reduced stimulus discrimination. Moreover, training words tended to be topographically similar (i.e., in print, color, and size) to those occurring in the natural environment even in condition I, which also probably enhanced stimulus generalization.

It is possible that if training had been conducted for a longer period, the differential effects of the training conditions would

have been more dramatic. However, time restrictions dictated the use of minimal criteria for response acquisition.

Due to the above limitations, the results of this study must be regarded as tentative. However, the results do suggest that future research could profitably investigate the effects of varying stimulus conditions on generalization. Specifically, future studies should include larger samples and probes conducted by more than one prober in a controlled manner. The present results suggest that training with multiple exemplars is more important in producing generalization than training in the natural environment. If this is so, the optimum number of exemplars needed to achieve generalization remains to be determined. Unless research demonstrates that training in the natural environment significantly enhances generalization, the expenditure of time, effort, and possible embarrassment involved in this method may not be justified.

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A. FOUR SETS OF WORDS

SET A: IN-OUT
- KEEP OUT
- CAUTION
- EXIT

SET B: LADIES-GENTLEMEN
- NO TRESPASSING
- NO SMOKING
- PRIVATE-PROPERTY

SET C: MEN-WOMEN
- POISON
- FIRE
- REST-ROOM

SET D: NAME
- SIGNATURE
- PUSH-PULL
- STOP

B. CONDITION - SET ARRANGEMENTS / ORDER OF TRAINING

ORDER OF TRAINING	SUBJECT LORI	FRANCES	LARRY
1.	CONDITION II, SET C	CONDITION IV, SET D	CONDITION I, SET C
2.	CONDITION IV, SET A	CONDITION III, SET B	CONDITION II, SET B
3.	CONDITION I, SET B	CONDITION II, SET C	CONDITION IV, SET D
4.	CONDITION III, SET D	CONDITION I, SET A	CONDITION III, SET A

C. WORD/TEST SETTING / INSTRUCTION / CRITERION

A 1. IN-OUT
- ALBERTSONS AT GRESHAM MALL
- "GO IN THE STORE"
- SUBJECT GOES DIRECTLY THROUGH THE IN-DOOR

2. KEEP-OUT
- 181st & HALSEY
- "CAN YOU GO IN HERE"
- SUBJECT SAYS "NO"

3. CAUTION
- SROU-HOME
- "IS IT SAFE TO EAT OR DRINK THIS"
- SUBJECT SAYS "NO"

4. EXIT
- GRESHAM HOSPITAL
- "GO OUT OF HERE"
- SUBJECT LEAVES BUILDING AT EXIT SIGN

B 1. LADIES-GENTLEMEN
- TACO-BELL, 196th & STARK
- "GO TO THE RESTROOM"
- SUBJECT ENTERS THE APPROPRIATE DOOR

2. NO-TRESPASSING
- [illegible] & SANDY BLVD.
- "CAN YOU GO IN HERE"
- SUBJECT SAYS "NO"

3. NO-SMOKING
- SUNSET DIVISION & 257th
- "IS IT OK TO SMOKE CIGARETTES HERE"
- SUBJECT SAYS "NO"

4. PRIVATE-PROPERTY
- 148th & FREEMONT
- "CAN YOU GO IN HERE"
- SUBJECT SAYS "NO"

C 1. MEN-WOMEN
- BLUE-LAKE PARK
- "GO TO THE PROPER DOOR"
- SUBJECT ENTERS THE APPROPRIATE DOOR

2. POISON
- GROUP-HOME
- "IS IT SAFE TO EAT OR DRINK THIS"
- SUBJECT SAYS "NO"

3. FIRE
- GRESHAM HOSPITAL
- "WHAT WOULD YOU DO IF THERE WAS A FIRE HERE"
- SUBJECT INDICATES TO PULL FIRE ALARM

4. REST-ROOM
- GRESHAM HOSPITAL
- "GO TO THE REST ROOM"
- SUBJECT ENTERS REST ROOM

D 1. NAME
- GROUP-HOME [illegible]
- "WRITE YOUR NAME IN THE PROPER SPACE"
- SUBJECT WRITES NAME IN CORRECT SPACE

7. SIGNATURE
GROUP-HOME 1040 FORM
"WRITE YOUR NAME WHERE THE PAPER SAYS TO."
SUBJECT WRITES NAME IN CORRECT SPACE

8. PUSH-PULL
GRESHAM MALL, NORTH ENTRANCE
"GO OUT THE DOOR."
SUBJECT'S INITIAL RESPONSE, PUSH, IS CORRECT

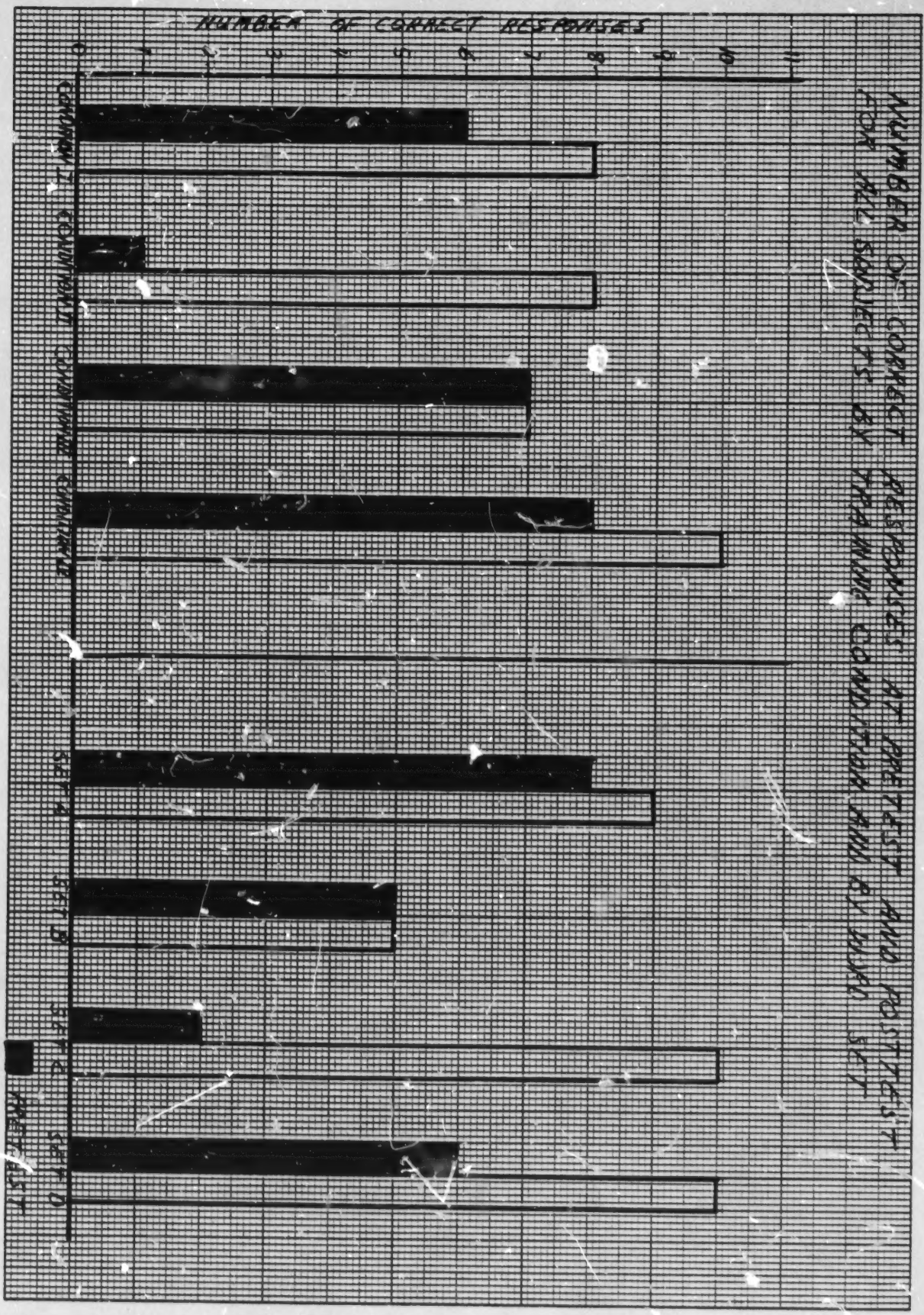
4. STOP
5TH & KELLY IN GRESHAM
"WHAT DOES A CAR DO WHEN IT COMES TO THAT SIGN"
SUBJECT SAYS STOP

D. POSTEST / PRETEST RESULTS

+ = correct
o = incorrect

WORD SET	WORD	LORI		FRANCES		LARRY	
		PRETEST	POSTEST	PRETEST	POSTEST	PRETEST	POSTEST
A	IN-OUT	o	+	o	o	o	+
	KEEP OUT	+	+	+	+	+	+
	CAUTION	+	+	+	+	+	+
	EXIT	+	+	o	o	+	o
B	LADIES-GENTLEMEN	+	o	+	o	o	o
	NO TRESPASSING	+	o	o	o	o	o
	NO SMOKING	+	+	+	+	o	+
	PRIVATE PROPERTY	o	+	o	o	o	+
C	MEN-WOMEN	o	+	o	o	o	+
	POISON	+	+	o	+	+	+
	FIRE	o	+	o	+	o	+
	RESTROOM	o	o	o	+	o	+
D	NAME	o	+	o	+	o	o
	SIGNATURE	o	o	o	+	o	+
	PUSH-PULL	+	+	+	+	+	+
	STOP	+	+	+	+	+	+

FIGURE 1



NUMBER OF CORRECT RESPONSES AT PRETEST AND POSTTEST FOR ALL SUBJECTS BY TYPE OF CONDITION AND RULE SET

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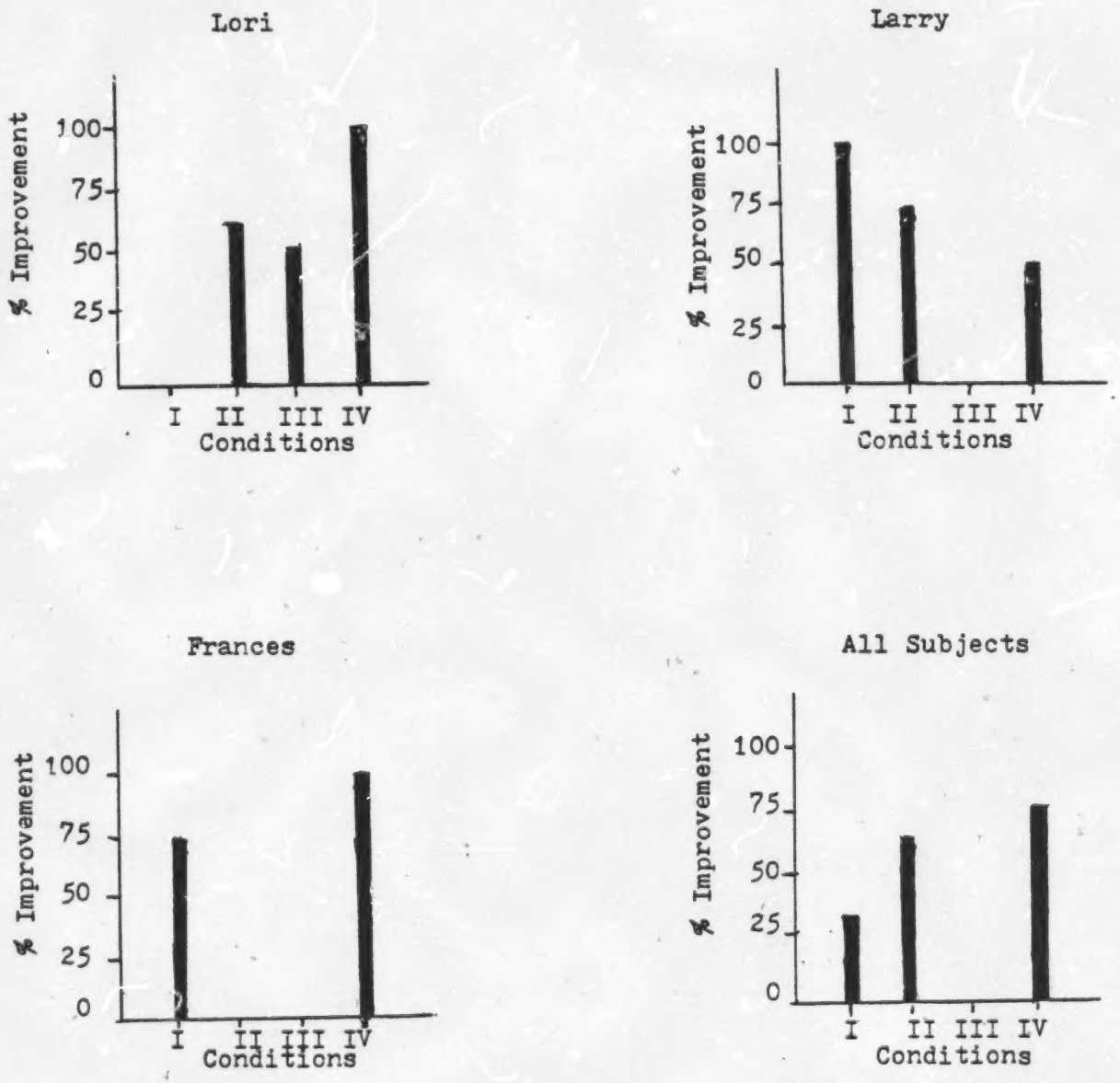
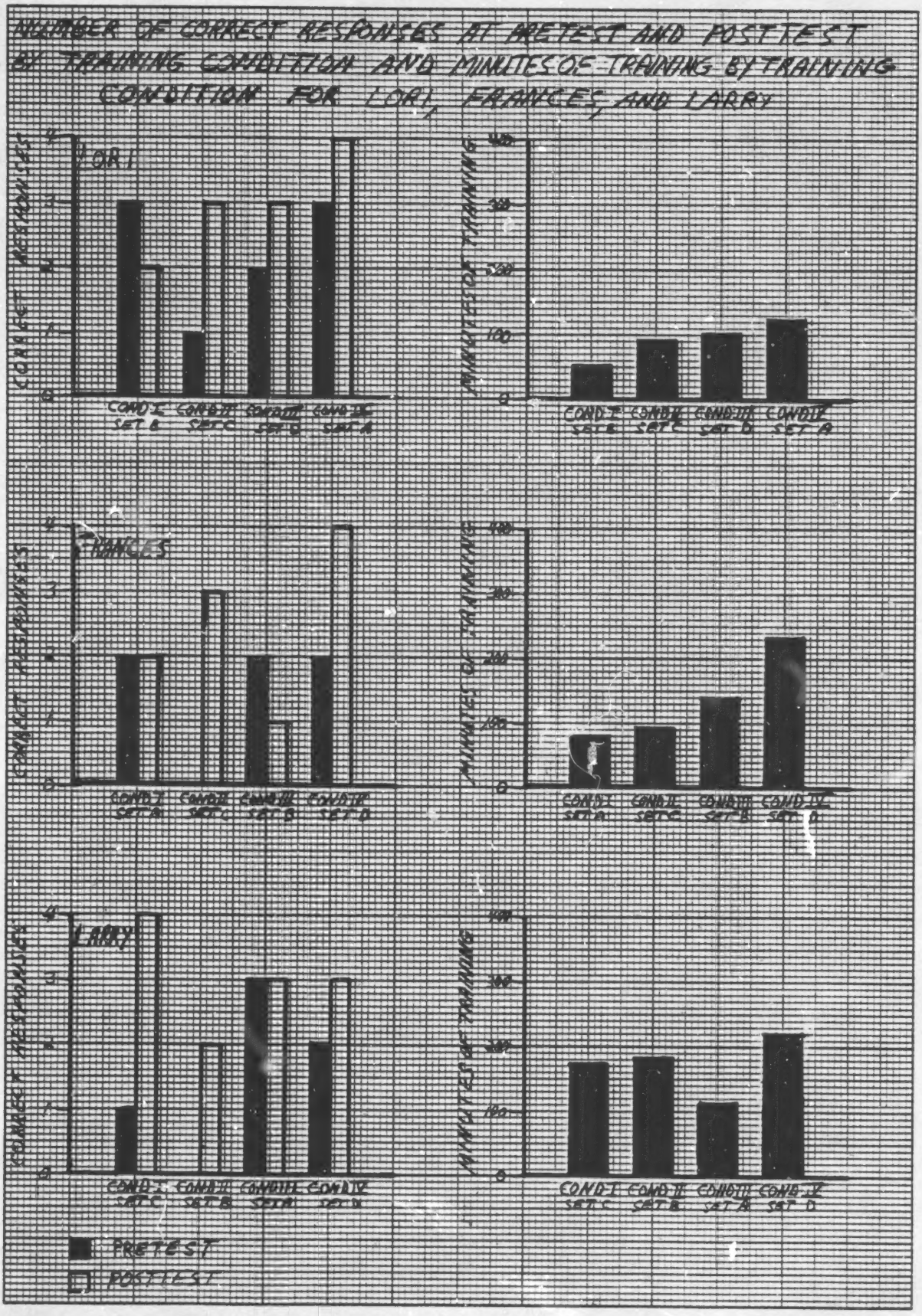
FIGURE 2

Percent of Possible Improvement Achieved by Training Condition For Each Subject and For All Subjects Combined.



Percent of Possible Improvement Achieved $= \left(\frac{\text{Posttest Score - Pretest Score}}{\text{Total Possible - Pretest Score}}\right) \times 100.$

FIGURE 3


NUMBER OF CORRECT RESPONSES AT PRETEST AND POSTTEST BY TRAINING CONDITION AND MINUTES OF TRAINING BY TRAINING CONDITION FOR LORI, FRANCES, AND LARRY
LORI
FRANCES
LARRY
CORRECT RESPONSES
MINUTES OF TRAINING
COND I COND III COND IV COND II
SET B SET C SET D SET A
PRETEST
POSTTEST